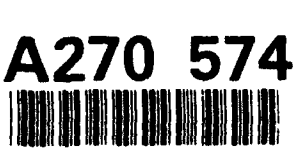

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Alcohol-Related Mortality in the US Air Force, 1990

Ronald W. Stout; Michael D. Parkinson; William H. Wolfe

Armstrong Laboratory (AFMC)
Aerospace Medicine Directorate
Epidemiologic Research Div., Epidemiology Services Br.
2601 West Road, Suite 2
Brooks AFB TX 78235-5241

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Alcohol-related morbidity and mortality represent a major public health problem in the United States, particularly among young males. Standardized comparisons of alcohol use have demonstrated that military members consume more alcohol than matched civilians. To quantify the impact of alcohol use by active duty Air Force members for calendar year 1990, we reviewed 283 death certificates and analyzed the cause of death using the Alcohol-Related Disease Impact (ARDI) computer program. Injuries accounted for 73% of all deaths among active duty Air Force personnel with motor vehicle accidents (MVAs) comprising 31% of total mortality. Sixty-six deaths (23%) were attributable to alcohol-related causes and accounted for 2,300 years of potential life lost before age 65. Analysis of blood alcohol levels taken from a subset of active duty deaths from MVAs and suicides yielded alcohol-attributable fractions which were similar to those obtained by the ARDI method. The implications of these findings and the use of the ARDI analysis in emphasizing and targeting public health programs in military populations are discussed.

Alcohol, Accidents, Injuries, Mortality, Military

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Alcohol-Related Mortality in the U.S. Air Force, 1990

Ronald W. Stout, MD, MPH
Michael D. Parkinson, MD, MPH
William H. Wolfe, MD, MPH

Alcohol-related morbidity and mortality represent a major public health problem in the United States, particularly among young men. Standardized comparisons of alcohol use have demonstrated that members of the military consume more alcohol than matched civilians. To quantify the impact of alcohol use by active duty members of the Air Force for calendar year 1990, we reviewed 283 death certificates and analyzed the cause of death using the Alcohol-Related Disease Impact (ARDI) computer program. Injuries accounted for 73% of all deaths among active duty Air Force personnel, with motor vehicle accidents (MVAs) accounting for 31% of total mortality. Sixty-six deaths (23%) were attributable to alcohol-related causes and accounted for 2,300 years of potential life lost before 65 years of age. Analysis of blood alcohol levels taken from a subset of active duty deaths resulting from MVAs and suicides yielded alcohol-attributable fractions similar to those obtained by the ARDI method. Periodic assessment and dissemination of alcohol-related mortality statistics in the military using the ARDI methodology represent an important public health education tool. [Am J Prev Med 1993;9:220–3]

Within the past decade, alcohol use and abuse have received increased attention as major preventable causes of morbidity and mortality. Alcohol-associated events are the second leading cause of premature death in the United States, accounting for 1.5 million years of potential life lost (YPLL) before the age of 65.[1] Alcohol has been associated with intentional (suicide, homicide) and unintentional injuries (motor vehicle and boating accidents, falls, fires, drownings, and other injuries). Chronic alcohol ingestion is a risk factor for a wide range of cardiovascular, respiratory, digestive, mental, and metabolic disorders, and for malignant neoplasms.[2] Significant direct and indirect economic costs have been attributed to alcohol abuse.[3]

National surveys of civilian alcohol use have consistently shown that young men have the highest rate of both "heavy drinking" (greater than one ounce of ethanol a day) and "binge drinking" (five or more drinks per occasion).[4,5] Even though self-reported consumption of alcohol may significantly underestimate actual use,[6] self-reported alcohol consumption is an important indicator of injury risk. Per capita sales of alcohol show a positive correlation with self-reported consumption and high-risk behavior.[7] Even though both alcohol consumption[8] and alcohol-related traffic fatalities have been decreasing recently,[9] alcohol abuse continues to pose a significant public health problem.

Standardized comparisons of alcohol use in military and civilian populations have shown a consistent pattern of increased alcohol use among current or former members of the military.[10,11] Since 1980, the Department of Defense (DOD) has conducted periodic worldwide surveys of active duty military personnel to estimate the prevalence of drug and alcohol use and, most recently, a wide variety of other health-related behaviors. We compared standardized rates of alcohol use among civilians from the 1985 National Household Survey on Drug Abuse with the 1985 Worldwide Survey of Alcohol and Nonmedical Drug Use among Military Personnel. After controlling for known predictors of alcohol use (age, sex, race/ethnicity, education), we found that military personnel were significantly more likely than civilians to use alcohol and to drink heavily (heavy alcohol use reported by 11% of civilian and 20.8% of military respondents).[12]

Based upon the major impact of alcohol on mortality in young populations and the consistent finding that military personnel are more likely to drink and drink more heavily than their civilian counterparts, we estimated the impact of alcohol-related disease on the U.S. Air Force active duty population for 1990. We employed Alcohol-Related Disease Impact (ARDI), a

From the Epidemiologic Research Division, Armstrong Laboratory, Human Systems Center, Brooks Air Force Base, Texas (Stout and Wolfe); and the Division of Associated, Dental, and Public Health Professions, Bureau of Health Professions, Health Resources and Services Administration, Rockville, Maryland (Parkinson).

Address reprint requests to Major Stout, USAF, MC, FS, Senior Preventive Medicine Consultant, AL/AOES, 2601 West Road, Suite 2, Brooks Air Force Base, Texas 78235-5241.

computer software program used for both national and state estimates of alcohol-related disease impact in the public health sector.[2,13]

METHODS

This study estimates alcohol-related mortality in the U.S. Air Force for calendar year 1990. Some alcohol-related mortality estimates (motor vehicle deaths and suicides) are compared with blood alcohol detected at autopsy.

We calculated alcohol-related mortality estimates using the ARDI software.[14] ARDI is a menu-driven applications software package that operates a set of linked spreadsheets. It permits rapid calculation of alcohol use, misuse, and disease in populations using demographic, mortality and aggregate health care cost data. ARDI is similar in design to the second generation version of Smoking-Attributable Mortality, Morbidity, and Economic Costs software that produced estimates of the disease impact of cigarette smoking.[15,16] ARDI calculates both epidemiologic and health economic measures. These measures include alcohol-attributable mortality, alcohol-related YPLL, direct health care costs, indirect mortality costs, indirect morbidity costs, nonhealth sector costs, and costs for fetal alcohol syndrome.

Alcohol-attributable mortality is estimated by compiling a set of diagnoses generally accepted as causally linked to alcohol use and misuse. Alcohol-attributable fractions (AAFs) are then applied for each diagnosis for each five-year age group for men and women. AAFs are defined as the percentage of cases of injury or disease associated with alcohol use. Alternatively, the AAF defines the proportion of disease or injury that potentially could have been prevented in the absence of alcohol use or misuse. Chronic disease AAFs are estimated using data from clinical case series and analytical epidemiologic studies; AAFs for injuries are estimated from surveillance studies. For alcohol-defined diagnoses (e.g., alcohol poisoning, acute alcoholic hepatitis, etc.), all deaths were ascribed to alcohol use and misuse, and the AAF was set to unity (1.0).

We abstracted cause of death from all death certificates for Air Force active duty personnel for calendar year 1990. For each diagnosis, five-year age-group-specific mortality rates and confidence intervals (CIs) were calculated. Alcohol-related deaths estimated by the ARDI software package were compared to autopsy data from the Office of Special Investigations (OSI) (suicide and homicide deaths) and the Air Force Safety Center (motor vehicle accident deaths). Because reliable data for direct (medical) and indirect (last earnings, etc.) costs in the military setting were not available, we did not analyze economic impact.

YPLL were calculated to age 65 using previously described methods.[17] We used U.S. all-races data for 1985 to calculate alcohol-related YPLL. The YPLL is sensitive to both the number and prematurity of deaths. The alcohol-related YPLL represents the sum of years of life lost for all deaths attributed to alcohol use and misuse.

RESULTS

In 1990, there were 511,896 active duty members of the Air Force, of whom 70,609 (14%) were women. Approximately 15% of Air Force members were black, and 4% were categorized as other. Two hundred and ninety-one deaths of active duty personnel were reported; 9 (3%) were women. Death certificates were obtained and reviewed for 283 (97%) of these deaths. Subsequent analysis was limited to those deaths for which death certificates were obtained.

Intentional and unintentional injuries accounted for 76% of total mortality (216/283). Motor vehicle accidents (MVAs) accounted for 31% (87/283) of the total; suicide, for 16% (44/283); homicide, (for 4% (10/283); and drowning, for 3% (9/283). Thirty-three of the 38 aircraft accident deaths (including a mass-casualty accident) occurred as a result of military aircraft operations, and six deaths occurred from other on-duty incidents. These 39 operationally related deaths were not included in the ARDI analysis. Forensic investigation of these deaths did not reveal any evidence of alcohol involvement.

Cardiac events caused 17% (49/283) of the deaths. Deaths classified as "other" (6%, 18/283) included those secondary to cerebrovascular disease, infections, and neoplasms.

Based on the application of the ARDI model to the mortality data, we found that 66 active duty persons died from alcohol-related causes (23% of total Air Force mortality) (Table 1). Women accounted for only 3 (4.5%) of the alcohol-related deaths. Alcohol-related mortality (ARM) accounted for 33% (3 of 9) of the female deaths and 23% (63 of 274) of the male deaths. MVAs, suicides, miscellaneous injuries, and homicides were the leading causes of alcohol-related deaths.

The Air Force Safety Center, which records and reviews injury data involving Air Force active duty personnel, recorded 92 MVA deaths in 1990. Blood alcohol information was available on 76 (83%) of MVA deaths. The presence of alcohol was either recorded in a yes/no format or by a specific blood alcohol level ranging from .02 to .40 μg/dL. Detectable blood alco-

Table 1. Alcohol-attributable fractions (AAFs), cause-specific mortality, and estimated alcohol-related mortality (ARM), active duty members of the U.S. Air Force, 1990

Diagnosis (ICD-9-CM rubric)	AAFs	No. deaths	ARM[a]
Unintentional injuries			
Motor vehicle accidents (E810–E825)	0.42	87	37
Air/space transport accidents (E840–E845)	0.16	5	1
Accidents caused by fires (E890–E899)	0.45	1	0
Accidental drownings (E910)	0.38	9	3
Other injuries	0.25	22	6
Intentional injuries			
Suicide (E950–E959)	0.28	44	12
Homicide (E960–E969)	0.46	10	5
Digestive diseases			
Alcoholic fatty liver (571.0)	1.00	2	2
Cardiovascular diseases			
Essential hypertension (401)	0.08	2	0
Cerebrovascular disease (430–438)	0.07	3	0
Total		185	66

[a]Rounded to nearest whole number.

hol was found at autopsy in 37 (49%) of those tested. Sixteen deaths were recorded in those younger than 21 years of age (the legal drinking age in most states), and at autopsy detectable alcohol levels were found in 10 (63%).

The OSI is the Air Force organization responsible for criminal investigations and, as part of this responsibility, investigates all Air Force active duty suicides. In 1990 the OSI recorded 51 suicide deaths. Blood alcohol was checked in 42 of these deaths and was found in 16 (38%) of those tested.

Age-specific alcohol-related death rates were highest in the ≤19 years and 45–49 years age groups (Table 2). The crude ARM death rate was 12.9 per 100,000 active duty members of the Air Force.

The alcohol-related deaths drop from the group comprising personnel younger than 20 years of age to the following groups, until they rise in those personnel 45–49 years of age. Deaths for those younger than 20 and older than 40 are based on relatively small populations-at-risk and are quite variable. Nevertheless, personnel at these extremes of the age distribution appear to be at substantially increased risk of ARM.

YPLL as a result of alcohol are shown in Figure 1. ARM accounted for almost 2,300 YPLL before age 65, with unintentional injuries accounting for 72% of the total. MVAs are clearly the primary cause of excess YPLL.

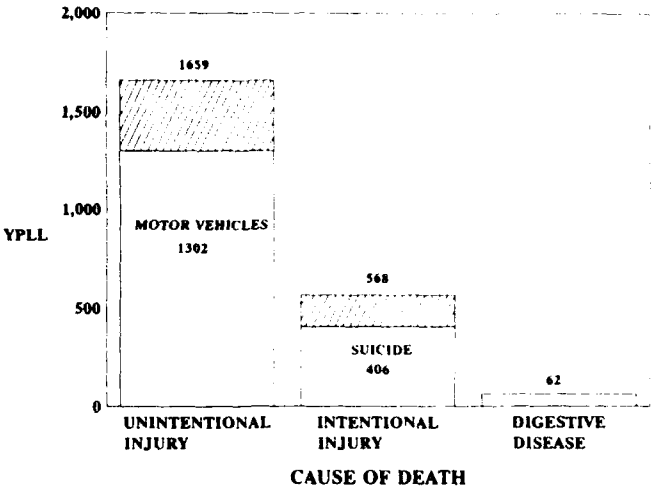

Figure 1. Alcohol-related years of potential life lost (YPLL) to age 65 by cause, active duty members of U.S. Air Force, 1990.

DISCUSSION

Population-based estimates of the morbidity and mortality attributable to modifiable risk factors have been shown to be an effective means of measuring the impact of smoking and alcohol abuse in civilians. Such calculations are very useful for educational purposes, initiating public health interventions, and monitoring the impact of health promotion programs or secular changes in risk factor–related diseases and deaths. Available demographic data and prevalence of these risk factors in the military services create a particularly appropriate population for such periodic epidemiological assessments.

The U.S. Air Force, like the other military services, is predominantly composed of healthy young men. In 1990, 54% of the Air Force population were men younger than 30, and 77% were younger than 40. With this age pattern, not surprisingly, the leading cause of death among active duty members in a noncombat environment is unintentional injuries, with the vast majority of those from MVAs. Similarly, suicide and homicide are significantly important causes of mortality. Excessive alcohol consumption is the single most important preventable cause of death in this population.

Table 2. Alcohol-related mortality rates by age, active duty members of the U.S. Air Force, 1990

Age	Alcohol-related deaths	Population	Age-specific rate per 100,000 (95% CI)
17–19 years	3	4,993	60 (0, 128)
20–24 years	19	113,792	17 (9, 24)
25–29 years	16	134,956	12 (6, 18)
30–34 years	12	109,202	11 (5, 17)
35–39 years	9	80,465	11 (4, 18)
40–44 years	3	49,759	6 (0, 13)
45–49 years	4	15,326	27 (1, 52)

The exact percentage of intentional and unintentional injuries that can be associated with alcohol use in the U.S. Air Force is problematic for many reasons. ARDI's estimates of AAFs rely upon civilian U.S. injury surveillance studies that reported alcohol involvement. As such, AAFs are dependent, to a significant degree, upon the prevalence of alcohol consumption in the studied populations. In addition, such studies are constrained by the lack of standardized units for measuring blood-alcohol concentration and disparities in defining intoxication.

Likely, the ARDI underestimates the true impact of alcohol-related deaths in our population of active duty personnel. Comparisons of alcohol use demonstrate that members of the military are substantially more likely to drink and drink heavily than matched civilians. The ARDI software uses civilian population estimates of ARM that reflect civilian alcohol consumption patterns. One would expect that the AAF for injuries and illnesses among military personnel is likely to be higher than that calculated by the ARDI method. Analysis of blood alcohol levels obtained at autopsy from Air Force injury victims indicates a slight elevation in the percentage of deaths with alcohol involvement compared to ARDI estimates (Air Force AAF for MVA is 49% versus the 42% calculated by ARDI; Air Force AAF for suicide is 38% versus 28% calculated by ARDI). Alternatively, perhaps the strict Air Force policy against drunken driving and the increasing emphasis on alcohol education programs offsets to some (unknown) degree an even greater potential disease impact in this population.

The DOD has progressed significantly toward decreasing drug and alcohol abuse among military personnel. The percentage of military personnel who used any drugs in the past 30 days declined from 27.6% in 1980 to 4.8% in 1988. The percentage who were heavy drinkers declined from 14.1% in 1980 to 8.2% in 1988.[18] However, much remains to be done, particularly with regard to excessive alcohol use. The high rate of alcohol-related deaths and YPLL in the military population

younger than 21 years (the legal drinking age in most states) is disturbing.

These service-specific estimates may prove to be particularly useful in targeting educational strategies for young active duty members of the Air Force in recruit training and first assignments, commanders, and health care professionals. Health promotion programs conducted at base level for active duty personnel should emphasize education about moderation of alcohol intake and of seat belt use. The U.S. Preventive Services Task Force has recommended that health care providers inquire about alcohol use routinely during periodic medical examinations.[19] Selected instruments, such as the "CAGE" questionnaire,[20] could be used effectively to identify individuals with possible problem drinking. Routine assessment in the emergency room of alcohol use patterns in Air Force personnel involved in intentional or unintentional injuries could also prove effective in the early detection and treatment of alcohol abuse.

The active duty member of the military is younger and healthier than the general population. While cardiovascular disease and cancer and their attendant risk factors (smoking, hypertension, overnutrition, sedentary lifestyle, etc.) are addressed in most health promotion efforts, the leading cause of death in the predominantly male Air Force population is injury, which is frequently associated with alcohol use and misuse. Periodic assessment of alcohol-related disease data and dissemination of results to specific targeted populations will enhance current efforts to decrease alcohol abuse. This effort should decrease the numbers of alcohol-related injuries in military personnel.

The views expressed in this article are the authors' and do not necessarily reflect policy of the U.S. Air Force or the Department of Defense.

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